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INFORMING THE NATION

Federal Information Dissemination in an Electronic Age

Summary

UNITED STATES CONGRESS OFFICE OF TECHNOLOGY ASSESSMENT

J952-94

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Foreword

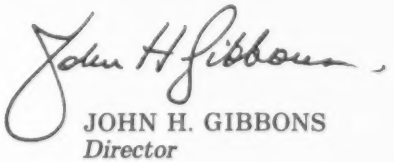
Federal information is essential to public understanding of many issues facing Congress and the Nation, and is used by all sectors of society. Technological advances are opening up many new and potentially cost-effective ways to collect, manage, and disseminate this information. Although traditional ink-on-paper publications will continue to meet important needs for the foreseeable future, many types of Federal information—such as statistical, reference, and scientific and technical—are well suited to electronic storage and dissemination. For example, an entire year's worth of the *Congressional Record* or several Bureau of the Census statistical series can be placed on one compact optical disk that can be easily read with a low-cost reader and basic microcomputer. Press releases, weather and crop bulletins, and economic or trade indices can be disseminated immediately via electronic bulletin boards or online information systems.

This report addresses the opportunities to improve the dissemination of Federal information. It also highlights two major problems: maintaining equity in public access to Federal information in electronic formats, and defining the respective roles of Federal agencies and the private sector in the electronic dissemination process. The report focuses on current and future roles of the U.S. Government Printing Office (GPO) and Superintendent of Documents, the Depository Library Program (administered by GPO), and the National Technical Information Service (NTIS). In addition, this report examines electronic dissemination of congressional information, the Freedom of Information Act in an electronic environment, and electronic dissemination of government information to the press.

In conducting this assessment, OTA drew on expertise and perspectives from numerous sources in and outside of the government. OTA received special assistance from the General Accounting Office (GAO) for the surveys of Federal information dissemination practices and Federal information users, from GPO with respect to Federal printing and related dissemination activities, and from NTIS with regard to dissemination of scientific and technical information. OTA appreciates the participation of the advisory panelists, contractors, working group participants, Federal agency officials and Federal information users who responded to the GAO surveys, and members of the library, academic, business, labor, consumer, and Federal agency communities, among others, who helped bring this report to fruition.

The report responds to an initial request from the Joint Committee on Printing and subsequent expressions of interest from the Subcommittee on Government Information, Justice, and Agriculture of the House Committee on Government Operations, the House Committee on Science, Space, and Technology, the Committee on House Administration, and the Subcommittee on Legislative of the House Committee on Appropriations.

The report is solely the responsibility of OTA, not of those who assisted us in the assessment or of the congressional committees who requested or endorsed the undertaking of the study.



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NOTE: OTA gratefully acknowledges the members of this advisory panel for their valuable assistance and thoughtful advice. The panel does not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

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Photo credit: U.S. Department of Agriculture

Farmer using a videodisk with self-help and financial planning programs from the Extension Service.

Summary

INTRODUCTION

> If a Nation expects to be ignorant and free in a state of civilization, it expects what never was and never will be . . . if we are to guard against ignorance and remain free, it is the responsibility of every American to be informed.
>
> —*Thomas Jefferson, July 6, 1816*

Federal information is used by all sectors of society. For example, the business and financial communities look to price levels and government indicators of economic activity as important inputs to business planning and investment decisions. Similarly, the agricultural community regularly uses government crop and weather bulletins, as well as forecasts, to aid in scheduling crop planting. Scientists and engineers benefit from technical information generated by federally conducted or sponsored research in areas like superconductors, supercomputers, and solar energy. Indeed, information generated by the Federal Government spans the entire spectrum of issues and programs relevant to agency missions—from public health crises, such as AIDs; to environmental problems, such as hazardous waste disposal and water pollution; to demographic and employment trends. And at the most basic level, information about governmental processes—such as the *Congressional Record* for Congress and the *Federal Register* for the executive branch agencies—is used by citizens and organizations that wish to monitor and participate in a wide range of government activities.

For most of this Nation's history, Federal information has been disseminated predominantly in the form of paper documents and, in recent decades, to a lesser extent in microfiche. However, in the last few years, technological advances have resulted in a rapid increase in the use of electronic formats for Federal information dissemination. While the use of electronic technology offers many new opportunities for cost-effective dissemination, serious conflicts have arisen over how to maintain and strengthen public access to government information and balance the roles of individual Federal agencies, governmentwide dissemination mechanisms, and the private sector.

OTA has concluded that congressional action is urgently needed to resolve Federal information dissemination issues and to set the direction of Federal activities for years to come. The government is at a crucial point where opportunities presented by the information technologies, such as productivity and cost-effectiveness improvements, are substantial. However, the stakes, including preservation and/or enhancement of public access to government information plus maintenance of the fiscal and administrative responsibilities of the agencies, are high and need to be carefully balanced by Congress.

Congress has enacted numerous laws that emphasize the importance of broad public access to Federal information (such as the Printing Act of 1895, Depository Library Act of 1962, Freedom of Information Act of 1966, and Paperwork Reduction Act of 1980) and assign various information dissemination functions to individual Federal agencies (see box A) and governmentwide clearinghouses. The latter include principally the Superintendent of Documents (SupDocs) at the U.S. Government Printing Office (GPO), Depository Library Program (DLP) also at GPO, National Technical Information Service (NTIS), and Consumer Information Center (CIC). However, the existing statutory and institutional framework was established by Congress largely during the preelectronic era. It is important, therefore, that Congress review this framework to determine what actions are needed to ensure that legislative intent is carried out in an electronic environment and whether any adjustments in legislative objectives or legislation are needed.

Box A.—Information, the Lifeblood of the Federal Government

Information is truly the lifeblood of many Federal Government programs and activities and is essential to the implementation of agency missions as well as to informed public debate concerning such programs and activities. Congress has enacted hundreds of specific laws that assign information dissemination and related functions to Federal agencies. Some illustrative laws include:

- Public Law 96-374, Education Act Amendments of 1980, Department of Education to establish an information clearinghouse for the handicapped;
- Public Law 96-399, Housing and Community Development Act of 1980, Department of Housing and Urban Development to collect and report data on sales prices for new homes;
- Public Law 96-482, Solid Waste Disposal Act Amendments of 1979, Environmental Protection Agency to collect, maintain, and disseminate information on energy and materials conservation and recovery from solid waste;
- Public Law 97-98, Agriculture and Food Act, Department of Agriculture to develop an agricultural land resources information system and to establish relations with foreign agricultural information systems;
- Public Law 97-290, Export Trading Company Act of 1982, Department of Commerce to disseminate information on export trading;
- Public Law 98-362, Small Business Computer Crime Prevention Act, Small Business Administration to establish an information resource center on computer crime;
- Public Law 99-412, Conservation Service Reform Act of 1985, Department of Energy to disseminate information annually to States and public utilities on residential energy conservation; and
- Public Law 99-570, National Antidrug Reorganization and Coordination Act, Department of Health and Human Services to establish a clearinghouse for alcohol and drug abuse information.

SOURCE: Congressional Research Service and Office of Technology Assessment, 1988.

This assessment presents information and analyses on a broad range of topics and issues. It is intended to:

- help both Congress and the Nation better understand Federal information dissemination in an electronic age; and
- assist Congress in implementing improvements in Federal information dissemination activities.

The focus of this report is on public information, that is, Federal information that is or should be in the public domain and is not subject to exemption under the Freedom of Information Act (e.g., due to privacy, security, or confidentiality considerations). The report focuses on the process of information dissemination, including the Federal Government's technical and institutional infrastructure for dissemination, not on information collection (although also important). The report considers a wide range of information formats—from paper and microfiche to computer tapes and diskettes, compact disks, and online databases. And the report covers all major types of Federal information at a general level—including agency reports and pamphlets, rules and regulations, periodicals and bibliographies, statistical information, and scientific and technical information, among others.

OPPORTUNITIES

The Federal Government today stands at a major crossroads with respect to the future of Federal information dissemination. Technological advances have opened up many new and potentially cost-effective ways to disseminate Federal information, especially those types of information (such as bibliographic, reference, statistical, and scientific and technical) that are particularly well suited to electronic formats.

OTA expects several key underlying technical trends to continue unabated for at least the next 3 to 5 years and 10 years or more in many cases. These include:

- continued, steady improvement in the price/performance of microcomputers, nonimpact printers, scanners, and desktop software;
- rapid proliferation of desktop publishing systems and continued improvement in the ability of desktop systems to produce higher quality, more complex documents;
- rapid growth in networking of desktop and high-end systems, nonimpact printers, and phototypesetters used for more complex, higher volume, and/or larger institutional applications;
- continued increase in the number and use of computerized online information services and online information gateways (that provide the channels for information exchange), and continued advances in the underlying computer and telecommunication technologies;
- rapid advances in optical disk technologies and applications, including accelerating penetration of CD-ROM (compact disk read-only memory), maturation of WORM (write once read many times) and erasable optical disks, plus emergence of CD-I (compact disk interactive, with audio, video, graphics, textual, and software capabilities all on one disk); and
- rapid advances in the development of expert systems applicable to many aspects of information dissemination—including technical writing, indexing, information retrieval, and printing management.

Many individual Federal agencies already are experimenting with and increasingly implementing information dissemination via electronic bulletin boards, floppy disks, compact optical disks, desktop publishing, and electronic printing-on-demand. For example, statistical data are highly suited to electronic formats, and, based on the results of the General Accounting Office (GAO) survey of Federal agencies (see box B), about one-third of the civilian departmental agencies use magnetic tape or disks, one-fifth floppy disks and electronic data transfer, and one-tenth electronic mail for dissemination of statistical data (see Table 1-1). By comparison, about three-fourths of the agencies use paper and roughly one-tenth use microfiche for disseminating statistical data. Overall, civilian agencies (departmental and independent) reported over 7,500 information products disseminated electronically, as of fiscal year 1987. The number of civilian agency publications in paper format appears to be declining slowly, while the number of electronic products has more than tripled over the past 4 years. The GAO survey results suggest that this trend will continue. For example, by 1990, agency use of electronic mail and bulletin boards, floppy disks, and compact optical disks in disseminating scientific and technical information is expected to more than double, on the average, as shown in Table 1-2.

With respect to demand for Federal information, OTA has concluded that, for the foreseeable future, paper will continue to be the preferred format for many purposes, such as browsing government reports, and microfiche will continue to be used for document storage and archival purposes. However, **OTA's 3- to 5-year outlook for the dissemination of Federal information indicates that overall demand for paper formats will decline modestly and the demand for microfiche will drop rather markedly, while the demand for electronic formats will increase dramatically.**

There already is a significant demand for Federal information in electronic formats among user groups, and particularly within the library

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Box B.—General Accounting Office Surveys of Federal Agencies and Federal Information Users

GAO, at the request of the Joint Committee on Printing, conducted several surveys that provided important input to the OTA report. Copies of the complete results are available from GAO.

Federal agency survey. In 1987, GAO surveyed all 13 cabinet-level departments and 48 major independent agencies with respect to information dissemination practices, technologies, budgets, plans, and policies. GAO asked department or agency senior Information Resources Management officials to coordinate the response but to consult with agency printing officers, librarians, publishers, and public information officers, among others. GAO asked that the cabinet departments provide a separate response for each major subdivision or component, such as bureaus or administrations. GAO received responses from 114 civilian departmental components, 11 Department of Defense components, and 48 independent agencies. GAO edited responses for completeness and internal consistency but did not independently verify their accuracy.

Overall, the survey results are very informative; however, the survey responses were unaudited and undocumented. Also, it is unclear how the agency responses were developed, especially with respect to evaluative questions. Nonetheless, the results present a useful overall picture of agency information dissemination activities.

Federal information user surveys. In 1987-1988, GAO surveyed four user groups: (1) GPO depository libraries; (2) other libraries; (3) scientific and technical associations; and (4) general associations. These groups were surveyed with respect to current and desired types and formats of Federal information.

As with the Federal agency survey, the results of the user surveys were not verified, and the exact process by which the responses were provided is not known. Also, the sampling error could be high, but it does not affect the OTA analysis since OTA has emphasized only the major trends and findings that emerged from these surveys.

Table 1-1.—Civilian Departmental Agency Dissemination of Statistical Information, by Format Used

Format used	Percent of agencies responding[a]
Paper	73
Magnetic tape/disk	32
Floppy disk	19
Electronic data transfer	18
Microfiche	12
Electronic mail	8
Microfilm	5
Electronic bulletin board	4
Videotape	2
Film	1

[a]Totals more than 100 percent since many agencies use more than one format.

SOURCE: General Accounting Office Survey of Federal Agencies, 1987.

community, private industry, Federal agencies themselves, and various groups with specialized needs (such as educators, researchers, and disabled persons). OTA projects that this demand will rise sharply over the next few years, especially among the more technically sophisticated user groups.

Table 1-2.—Civilian Departmental Agency Dissemination of Scientific and Technical Information, by Format Used, Current and Projected

Format	Percent of agencies responding: Use now (1987)	Use in next 3 years[a] (by 1990)	Percent change
Electronic mail	6.1	15.8	+159
Electronic bulletin board	6.1	10.5	+72
Electronic data transfer	14.9	18.4	+24
Magnetic tape/disk	14.0	16.7	+19
Floppy disk	8.8	16.7	+90
Compact optical disk	—	8.8	+

[a]Calculated by adding the percentage of agencies now (as of 1987) using the format indicated to the number who expect to use the format within the next 3 years (by 1990). Assumes that agencies currently using a format will continue to do so.

SOURCE: General Accounting Office Survey of Federal Agencies, 1987.

Photo credit: U.S. Government Printing Office

GPO computer room

The results of the GAO survey of Federal information users document this likely trend in demand. For example, the depository library community (as intermediaries reflecting users and user information needs in university, research, Federal, State, local, and public libraries) indicated a strong preference for obtaining increasing percentages of Federal information in electronic form and declining percentages in paper and microfiche. The survey results for 318 depository libraries out of a sample of 451 (34 of the 51 regional depositories and 284 of the 400 selective depository libraries sampled) are highlighted in Table 1-3. These results show that, by and large, the depository library community desires or anticipates decreases in use of paper and microfiche formats and significant increases in online databases and compact optical disks. Trends for other surveyed segments of the Federal information user community (e.g., nondepository libraries, scientific and technical associations) are not so dramatic, but show a similar pattern.

Electronic publishing and related technologies, when coupled with essential technical

Table 1-3.—Depository Library Demand for Federal Information, by Type and Format

		Number of libraries responding		
Type of information	Format	Demand now	Demand in next 3 years	Percent change
Congressional Record/hearings/ reports/ bills	paper	271	234	−14
	microfiche	274	225	−18
	online database	59	132	+124
	floppy disk	0	27	+
	compact optical disk	3	112	+3600
Scientific and technical reports/ information	paper	244	172	−17
	microfiche	212	159	−22
	online database	76	95	+25
	floppy disk	1	27	+2600
	compact optical disk	9	78	+770
Press releases/bulletins	paper	246	183	−26
	microfiche	39	35	−10
	electronic mail or bulletin board	9	51	+467
	online database	24	50	+108
	compact optical disk	1	18	+1700
Statistical data	paper	309	270	−13
	microfiche	241	134	−44
	electronic mail or bulletin board	12	27	+125
	online database	103	158	+53
	magnetic tape/disk	11	25	+127
	floppy disk	12	65	+442
	videodisk	0	12	+
	compact optical disk	15	140	+833

SOURCE: General Accounting Office Survey of Federal Information Users, 1988

standards, offer the near-term prospect for integrated information systems utilizing the "information life cycle" concept. Here, the collection, processing, storage, and dissemination (and ultimately retention or archiving) of information in multiple formats (paper, microform, and electronic) are viewed and implemented as interrelated functions rather than separate, unrelated activities. The life cycle concept offers the prospect of improvements in Federal productivity or cost avoidance through increased efficiencies in the publishing of government reports, reduced paper and postage costs, and the like (see box C).

The Federal Government should be able to realize at least a significant portion of the productivity improvements demonstrated by private business users. Private firms typically report 30 to 50 percent productivity improvement with a payback on investment in the 2- to 3-year range. The Federal Government spends, conservatively, $6 billion per year on information dissemination (not including the cost of collection, processing, or a prorated share of agency automation). Thus, **productivity improvements on the order of hundreds of millions of dollars per year appear to be readily achievable.** In addition, the substantial ongoing investment by Federal mission agencies in agency automation, if planned and implemented properly, can incorporate multi-format information dissemination at little additional marginal cost, compared to the total cost of automation, and with the potential for net cost savings in agency information functions.

PROBLEMS AND CHALLENGES

Technological advances are creating a number of problems and challenges with respect to Federal information dissemination:

- At a fundamental level, **electronic technology is changing or even eliminating many distinctions** between reports, publications, databases, records, and the like, in ways not anticipated by existing statutes and policies. A rapidly growing percentage of Federal information exists at some point in an electronic form on a computerized system as part of "seamless web" of information activities.
- **Electronic technology permits information dissemination on a decentralized basis** that is cost-effective at low levels of demand, but in ways that may challenge traditional roles, responsibilities, and policies. In contrast, conventional ink-on-paper printing technology tends to be cost-effective with more centralized production and distribution and higher levels of demand.
- **Electronic technology is eroding the institutional roles of governmentwide information dissemination agencies.** While many Federal agencies disseminate at least some of their information in electronic formats, the central governmentwide dissemination mechanisms (SupDocs, DLP, NTIS, and CIC) are presently limited largely to paper or paper and microfiche formats and thus disseminate a declining portion of Federal information.
- **Technology has outpaced the major governmentwide statutes** that apply to Federal information dissemination. The Printing Act of 1895, Depository Library Act of 1962, and Freedom of Information Act of 1966 predate the era of electronic dissemination, and have not been updated to explicitly reflect electronic as well as paper formats. The Paperwork Reduction Act of 1980 was amended in 1986 to include information dissemination within its scope, but substantive statutory guidance on electronic information dissemination per se is minimal.
- **The advent of electronic dissemination raises new equity concerns** since, to the extent electronic formats have distinct ad-

Box C.—Some Opportunities for Productivity Improvement or Cost Avoidance Through Electronic Technology

- Electronic publishing
  - —facilitates the document revision process by minimizing rekeyboarding and graphics redesign;
  - —produces documents that are generally found to be more attractive and easier to read;
  - —reduces the total publishing time typically by 25 to 50 percent;
  - —reduces the total number of document pages typically by 35 to 50 percent, since typeset pages contain more text than typewritten pages;
  - —reduces the costs for paper and postage for hard copy print runs; and
  - —can achieve rates of return on investment of up to 30 to 50 percent and payback periods of 2 to 3 years or less.
- Compact disk-read only memory (CD-ROM)
  - —can store and disseminate large amounts of information at very low cost;
  - —is best suited for statistical, reference, technical, and other information that does not require frequent updates;
  - —can store up to the equivalent of about 250,000 pages of typewritten, double-spaced text on one disk, or the equivalent of about 1,500 single-sided floppy disks or about 10 of the 1,600 bits-per-inch magnetic computer tapes;
  - —can reduce the cost of dissemination by an order of magnitude compared to magnetic tapes and up to two orders of magnitude compared to paper documents (a typical estimate is that the same amount of information that could be disseminated for $50 per week on CD-ROM would cost $345 per week on magnetic tapes and $2,250 per week in paper); and
  - —permits searching, retrieval, and manipulation of the data in ways simply not possible with paper (or microfiche) formats.

SOURCE: Office of Technology Assessment, 1988.

vantages (e.g., in terms of timeliness, searchability), those without electronic access are disadvantaged. In general, the library, research, media, public interest, consumer, and State/local government communities, among others, argue that the Federal Government has a responsibility to assure equity of access to Federal information in electronic formats as well as in paper. These groups contend that they are or will increasingly be disadvantaged to the extent that Federal information in electronic form is not available through normal channels.

- **Technological advances complicate the Federal Government's relationships with the commercial information industry.** While those companies that market repackaged or enhanced Federal information benefit from access to electronic formats, some of these firms are concerned about possible adverse effects of government competition. Efforts by the Office of Management and Budget (OMB) to establish policy in this area have proven to be controversial. Also, the privatization of major Federal information dissemination activities (such as the NTIS clearinghouse) has not yet been demonstrated to be either cost-effective or beneficial for important governmental functions.
- **OMB and industry representatives support government dissemination of Federal information in raw electronic form without software enhancements or searching aids, but oppose government dissemination of enhanced or "value-added" information.** This conflicts with the long-established government role in producing and disseminating value-added information products in paper format and its logical extension to electronic formats. Existing policy does not define "value-added" or specify under what conditions value-added electronic information products are inherently or appropriately governmental versus commercial in nature.
- **In general information industry represent-**

atives strongly favor open government and unimpeded and nondiscriminatory access to Federal information for philosophical and competitive fairness reasons (i.e., so that no single vendor has a captive or monopoly position over Federal information). In these respects, the industry shares common ground with the library, research, and press communities, among others.

The absence of congressional action to address these issues is likely to result in:

- continuing erosion in overall equity of public access to Federal information,
- continuing confusion over institutional roles and responsibilities,
- a significant time and dollar cost to the government and various stakeholders in seemingly endless debate over statutory interpretation and legislative intent,
- inefficiency and excessive duplication in electronic information dissemination research and pilot-testing,
- inability to capture learning from experience and economies of scale, and
- failure to realize the significant opportunities for cost-effective improvements in overall public access to Federal information.

OTA concluded that the government needs to set in motion a comprehensive planning process for creatively exploring the long-term future (e.g., 10 to 20 years from now) when the information infrastructure of the public and private sectors could be quite different. At the same time, the government needs to provide short-term direction to existing agencies and institutions with respect to electronic information dissemination. A central challenge is setting future directions for the governmentwide information dissemination institutions.

Any electronic future for GPO, NTIS, and DLP must consider the increasingly decentralized, competitive environment that characterizes the electronic information marketplace. The Federal Government is moving in the direction of implementing electronic information systems at the heart of most agency activities. In the long-term, the myriad of possible information dissemination alternatives, made possible by technological advances, could serve as a catalyst for significant changes in the current institutional framework. Full understanding of long-term alternatives will require several years of pilot tests, demonstrations, and experiments and related evaluation studies. In the short- to medium-term (3 to 10 years), the basis for setting directions is better established.

> . . . an intelligent, informed populace has been, is, and will continue to be the fundamental element in the strength of our Nation. Contributing greatly to that intellectual strength is the so-called Government document, designed to disseminate to the American public important information relative to the activities and purposes of its Government.
>
> —*former U.S. Senator Frank J. Lausche, March 1962*

GOVERNMENT PRINTING OFFICE

GPO has historically carried out most of the Federal Government's ink-on-paper printing, either directly or through private contractors, has marketed and sold selected government documents (in paper and microfiche) to the public (through the SupDocs), and has distributed government documents to the depository libraries (through the DLP). While GPO already makes extensive use of electronic input and photocomposition, there is very little production or sales of products in electronic formats. GPO does sell (through SupDocs) some agency and congressional products in magnetic computer tape format. It also has ongoing pilot projects involving both online and CD-ROM dissemination and both desktop and high-end electronic publishing, pursuant to direction of the Joint Committee on Printing (JCP).

Defining GPO's future role in the dissemination of electronic formats presents a major opportunity for Congress and GPO. One alternative, mandatory centralization of all electronic dissemination through SupDocs (or any other central government office), would conflict with numerous existing agency activities, would meet strong agency opposition, could precipitate legal and political challenges, and would not appear to be cost-effective. On the other hand, excluding electronic formats from the SupDocs sales program would erode the viability and integrity of the program over time, and compromise the ability of SupDocs to facilitate broad public awareness and use of Federal information. **A middle ground alternative, with SupDocs including selected electronic formats and products, would appear to strengthen the SupDocs sales program, facilitate public access, and preserve the prerogatives of the agencies to disseminate electronically themselves (and of private vendors to enhance and resell electronic formats).**

SupDocs sales of magnetic computer tapes, floppy disks, compact optical disks, and perhaps electronic printing-on-demand products would appear to be straightforward, except for a possible overlap with NTIS. Sales of online services could be more difficult due to staffing, software development, and capital requirements, and to more intensive competition with agencies and commercial vendors.

Another challenge is to define GPO's role relative to the growth in agency desktop and high-end electronic publishing systems. The GAO survey of 114 civilian agency components indicated that one-half or more are currently operating or pilot testing desktop publishing, computer-aided page makeup, and electronic composition technologies, and one-third are operating or testing full electronic publishing systems, as shown in Table 1-4. OTA estimates that, as of fiscal year 1987, agencies had already spent at least $400 million on electronic publishing-related technologies.

Photo credit: U.S. Government Printing Office

GPO operator using electronic photocomposition equipment

GPO could have a key role in standards-setting, training, and innovative activities relevant to electronic publishing, but GPO will be operating in a much more decentralized, competitive environment than has traditionally been the case with conventional ink-on-paper printing. The general demand for conventional printing is likely to continue for several years at a slow growth or steady-state level. However, in the medium-term (3 to 10 years), a sig-

Table 1-4.—Civilian Departmental Agency Use of Selected Electronic Publishing-Related Technologies

Technology	Percent of agencies responding: Currently in operational use	Currently prototyping or pilot testing	Totals
Computer-aided page makeup	50.0	8.8	58.8
Computer graphics	65.8	7.9	73.7
Electronic photocomposition	43.9	7.9	51.8
Laser and other nonimpact printing	64.0	1.8	65.8
Desktop publishing system	34.2	14.9	49.1
Electronic publishing system	21.1	10.5	31.6

SOURCE: General Accounting Office Survey of Federal Agencies, 1987.

nificant portion of GPO inplant and procured printing could be suitable for electronic dissemination or vulnerable to competition from electronic formats. The plans and activities of defense agencies are particularly important, since the Army, Navy, and Air Force together account for roughly one-third of total GPO billings. Over the next few years, the defense agencies are hoping to place most manuals, directives, and technical documentation on electronic media. **GPO will have to be innovative in matching its expertise to agency needs, which are likely to vary widely and change at an increasingly rapid pace.**

With respect to GPO's role in traditional ink-on-paper printing, the fiscal year 1987 GPO printing workload totaled $771 million, of which about three-quarters was procured from commercial printing contractors and one-quarter carried out at the GPO main and regional printing plants. As shown in Table 1-5, about 80 percent of legislative branch printing work is done inplant, while about 85 percent of executive branch printing work is contracted out. Overall, about 45 percent of inplant work is legislative, while about 95 percent of contracted work is for the executive branch.

OTA examined several alternatives, including decentralizing GPO's conventional printing and procurement functions, transferring GPO's procurement program to the executive branch, and limiting GPO to legislative branch work. Based on information available to OTA (including comparative costs of GPO inhouse, GPO procured, agency inhouse, and agency procured printing), none of these alternatives appears to be cost-effective. These alternatives would largely eliminate concerns about separation of powers, since executive branch printing would no longer be done by or through a legislative branch agency. However, they could complicate the functioning of SupDocs and the DLP, and could have significant adverse effects on the GPO labor force.

OTA identified several opportunities for improvement in GPO's traditional printing services. These include more competitive pricing and timely delivery of GPO main plant inhouse work for executive agencies, itemized estimating and billing practices, regular surveys of customer needs and problems, and revised and strengthened GPO advisory groups.

In principle, the GPO main plant is well positioned to meet demands for conventional printing, with one of the best equipped printing facilities in the United States and an experienced work force. However, GPO inhouse printing costs are high in part due to the need to maintain operational capacity to handle a wide diversity of printing work, and to meet peak congressional and priority executive branch workloads. A significant part of this workload is well suited for electronic formats (e.g., *Congressional Record*, *Federal Register*). A gradual transition from paper to electronic formats for these items could help reduce GPO costs, potentially increase access to this information, and place the GPO main plant on a more competitive footing for executive branch printing.

Table 1-5.—GPO Workload Distribution, Fiscal Year 1987 (in millions of dollars)

	Procured printing	Main plant printing	Regional plant printing	Totals
Legislative branch	$ 23	$ 90	NA	$113
Executive branch	552	90	$14	656
Judicial branch	1	1	NA	2
Totals	$576	$181	$14	$771

NA = not applicable.

SOURCE: U.S. Government Printing Office, 1987

NATIONAL TECHNICAL INFORMATION SERVICE

NTIS has historically served as the Federal Government's archive and clearinghouse for scientific and technical reports prepared by Federal agencies or contractors, along with related indices and bibliographies. The bulk of NTIS documents are provided in paper or microfiche format, although, in recent years, NTIS also has served as a clearinghouse for some electronic format products (e.g., software and databases). Also, NTIS performs other related services such as patent licensing, Japanese literature exchange, and FOIA request and/or information sales processing for a few agencies.

With respect to NTIS, the major opportunity is, quite simply, determining the future of NTIS as a government entity. NTIS faces strategic challenges on several fronts. First, the core NTIS business, as measured by sales of paper and microfiche reports, has been shrinking (by about 40 to 50 percent) over the past decade (see Table 1-6). In part as a result, NTIS prices for these reports have gone up considerably faster than the inflation rate in order to help maintain break-even operations. Over the last few years, NTIS has offset declining revenues from full-text reports and subscription, bibliographic, and announcement products with increasing revenues from services to other agencies (such as order billing and processing), brokerage fees on sales of other agency materials, and sales of computer-related products.

Photo credit: National Technical Information Service

NTIS staff pulls an archive document from the NTIS collection

Second, a significant percentage (estimated at one-third to one-half, see Table 1-7) of Federal scientific and technical reports are never provided to NTIS, since agency participation is strictly voluntary. The NTIS collection is thus becoming increasingly incomplete. Third,

Table 1-7.—Trend in New Titles Received by NTIS, Fiscal Years 1983, 1987

	1983	1987	Net change
Number of titles received	79,471	62,856	−21%
Estimated percentage of all relevant titles[a]	67%	53%	−14%

[a]Assumes the number of relevant agency titles remains constant at 119,000 per year.

SOURCE: National Technical Information Service and Office of Technology Assessment, 1988.

Table 1-6.—Trends in Sales of Selected NTIS Products, Fiscal Years 1980, 1987

	1980	1987	Net change
	in thousands of copies		
Paper documents	752	393	−48%
Microfiche documents	155	67	−57
	in millions of copies		
Selected Research in Microfiche (SRIM)	2.72	1.33	−51
	in thousands of subscriptions		
Government Research Announcements and Index	2.22	1.15	−48
Abstract Newsletters	16.0	6.8	−58

SOURCE: National Technical Information Service, 1988.

NTIS is being outdistanced by most of the Federal science agencies with respect to use of electronic information technology. And fourth, NTIS has been caught in the middle of the ongoing debate over privatization of Federal information functions. Since Congress has affirmed its intent that NTIS remain in the government, Congress now has the opportunity to determine where NTIS should be located and how it should relate to other Federal agencies, including what agency materials should or must be submitted to NTIS.

NATIONAL TECHNICAL INFORMATION SERVICE/ SUPERINTENDENT OF DOCUMENTS

Proposals have been made to retain NTIS in the Department of Commerce, as a government corporation or in essentially its present form; consolidate NTIS with SupDocs, either within GPO or as part of a newly established Government Information Office; and consolidate NTIS with the Library of Congress.

Whatever the alternative chosen by Congress, strengthened NTIS-SupDocs cooperation would likely lead to improvements in indexing, marketing, and international exchange of Federal information. And strengthened cooperation seems essential to the extent both agencies pursue sales of electronic format products and that SupDocs enters the low-demand market. At present, demand for NTIS documents averages about 10 copies per title, compared to about 2,000 copies per title for items in the SupDocs sales program (see box D for a comparison of NTIS and SupDocs).

NTIS and SupDocs could cooperate on implementing electronic technologies that would meet NTIS clearinghouse and archival needs, plus support a broadening of the SupDocs product line to include selected low-demand items. **Wherever located, NTIS appears to be ideally suited for implementation of an electronic document system (using optical disk storage, electronic printing, and multi-format output—paper, microfiche, and electronic), perhaps using the Defense Technical Information Center (DTIC) system as a prototype, that could revitalize NTIS if coupled with improved agency participation.** Overall, an electronic NTIS should be able to greatly increase the diversity and timeliness of NTIS (and related private vendor) offerings, increase the ability of NTIS (and private vendors) to match information products with potential users, and reduce costs.

> . . . the new [electronic] technology not only gives potential users quicker and more convenient access to wider bodies of information, including instantly current information, than can be provided by print alone; it also gives the user a new kind of ability to search through and manipulate the information, and in effect to create new information by the selection, combination, and arrangement of data.
>
> —*Commission on Freedom and Equality of Access to Information, American Library Association, 1986.*

DEPOSITORY LIBRARIES

The DLP is administered by GPO and serves as a mechanism for dissemination of Federal agency documents free of charge to the approximately 1,400 participating libraries. The libraries, in return, provide housing for the documents and access to this information free of charge to the general public. About 55 percent of the depository libraries are university libraries, 23 percent are public libraries, 11 percent are law school libraries, 7 percent are Federal libraries, and 4 percent are special libraries and the like.

Box D.—National Technical Information Service and Superintendent of Documents, How They Compare

	NTIS	SupDocs
Branch of government	Executive	Legislative
Location	Department of Commerce	GPO
Statutory authority	15 U.S.C. 1151-1157	44 U.S.C 1701-1722
Total annual revenues[a] (approximate)	$22 million	$100 million
Titles for sale (approximate)	2 million	20,000
Total annual sales volume[b]	6 million copies	27 million copies
Average sales per title	10 copies	2,000 copies
Primary document formats	paper, microfiche	paper, microfiche
Primary source of documents	Federal agencies and contractors	Federal agencies, Congress
Electronic products[c] (approximate)	800 numerical or statistical databases 300 textual databases 300 computer software items (incl. models)	few dozen magnetic tape products
Prepares bibliographies/ catalogs	Yes	Yes
Conducts marketing activities	Yes	Yes
Carries out international document exchange	Yes	Yes
Performs reimbursable services	Yes—for agencies	Yes—Consumer Information Information Center, Depository Library Program[d]

[a]Includes fiscal year 1987 revenues from reimbursable services and services funded through appropriations.
[b]Fiscal year 1987; SupDocs data include Consumer Information Center sales.
[c]Fiscal year 1987.
[d]Reimbursed through appropriations.

SOURCE: National Technical Information Service and U.S. Government Printing Office, 1988.

As with GPO and NTIS, there is a major opportunity to define the future role of the DLP with respect to dissemination of Federal information in electronic formats. **As agencies make increasing use of electronic formats, limiting the DLP to paper and microfiche products would, over time, reduce the type and amount of Federal information available to the public, and would erode the legislative intent of the DLP** (e.g., as expressed in the legislative history of the Depository Library Act of 1962). The impetus for including electronic information in the DLP is strong. The JCP has interpreted the DLP statutory provisions as extending to government information in all formats, and other congressional committees concur in the decision to disseminate certain electronic formats to depositories. OTA concluded that, if it is to succeed, this emerging policy needs to be further developed and refined, and have the support of DLP participants (especially libraries, GPO, and the agencies that are the source of most DLP materials). A variety of pilot projects, demonstrations, and tests involving various technologies, financial arrangements, and delivery mechanisms (including possible involvement of the private sector) is warranted. Ultimately, Congress may wish to

Photo credit: Documents Center, Robert W. Woodruff Library, Emory University

Librarian assisting user at reference desk at the Robert W. Woodruff Library

consider a reorganization or restructuring of the current DLP in light of both electronic information dissemination options now or likely to become available and the evolving nature of libraries and the telecommunication infrastructure.

An important reason for electronic pilot projects is to better understand the issue of costs to users, government, and depository institutions. **If the basic underlying principle of the depository program is to retain free access to government information for users, then Congress needs to be aware that there may be additional costs associated with the introduction of certain electronic services, and assist depository libraries and GPO in designing and financing ways to make this information available to the public.**

Distribution of selected government information products in CD-ROM format such as the bound, cumulated *Congressional Record* could improve access to such information and could be a cost-effective dissemination mechanism for certain datafiles. There could be some additional equipment and training costs associated with this format for the depository library participants. Delivery of online datafiles (such as the *Federal Register*) to the public through depository institutions requires pilot-testing to determine how best to provide access to this information, and how to ensure that the additional costs associated with online formats do not hinder public access or place unrealistic, unmanageable financial or administrative burdens on participating libraries.

The results of the GAO survey of Federal information users indicate a substantial depository library demand for electronic formats. The vast majority of libraries responding indicated that the *Record* and *Register*, along with an index to Federal information and database of key Federal statistical series, would be moderately to greatly useful in both online and CD-ROM formats, as shown in Table 1-8. The GAO survey also found that many of the depository libraries have access to key information technologies, as shown in Table 1-9.

Table 1-8.—Depository Library Demand for Federal Information in Electronic Formats

Item	Percent of libraries responding moderately to greatly useful[a]	
	Online immediate access	Offline CD-ROM issued monthly
Congressional Record	77	74
Congressional Committee Calendar/Bill Status	70	60
Federal Register	86	80
Federal Agency Press Releases	46	40
Agency Reports	61	62
Comprehensive Index to Federal Information	94	90
Integrated Database of Key Federal Statistical Series	90	88

[a]Based on responses from 318 depository libraries out of a sample of 451.

SOURCE: General Accounting Office Survey of Federal Information Users, 1988.

Table 1-9.—Depository Library Access to Information Technology

Information technology	Number of libraries with access[a]
Microcomputer without modem	283
Microcomputer with modem for online access	337
Microfiche reader without printer	352
Microfiche reader with printer	384
CD-ROM reader	169
Videodisk player	72
Mainframe computer	149

[a]Based on responses from 403 depository libraries out of a sample of 451 depository libraries.

SOURCE: General Accounting Office Survey of Federal Information Users, 1988.

TECHNICAL/MANAGEMENT IMPROVEMENTS

OTA identified several important technical/management alternatives that could be implemented under a wide range of institutional scenarios and could be implemented by agency action using existing statutory authorities and with congressional concurrence. These alternatives include:

- **Technical standards** on text markup, page/document description, optical disks, and other areas important to information dissemination (see box E). The National Bureau of Standards (NBS), DTIC (or another responsible Department of Defense component), and GPO could be assigned lead responsibility, presumably building on accepted or emerging private sector industry standards to the extent possible and working through the existing national and international standards organizations.
- **Governmentwide information index** to major Federal information products, regardless of format. GPO and/or NTIS could be assigned lead responsibility to consolidate and upgrade existing indices, directories, and inventories into one integrated index. The government could contract with private firms or library and information science professionals to carry out some of this work. The index could be made available in multiple formats and disseminated both directly from the government as well as via the depository libraries and private vendors (perhaps in enhanced form).
- **Innovation centers** to exchange learning and experience about technological innovations and user needs relevant to information dissemination. Such centers could be designated or established at, for example, DTIC (for the defense sector), NBS and NTIS (for the civilian executive branch), and GPO (for the legislative branch). DTIC, NBS, and GPO, along with several mission agencies, already have a variety of laboratory and/or demonstration activities under way. Agencies could be required to conduct "Agency X-2000" studies to creatively explore and develop their own visions of future information dissemination activities.
- **Revised Information Resources Management** (IRM) program. A variety of training, career development, budget reporting, and management actions could be taken to give information dissemination (including printing, publishing, public affairs, press, library, and related activities and personnel) a stronger and better understood role within the IRM concept.
- **Electronic press release service.** Press releases and other time-sensitive information (such as crop reports, weather bulletins, and economic and trade data) from major Federal agencies could be electronically provided directly to the press, via

Box E.—The Importance of Text Markup and Page Description Standards for Information Dissemination

Text markup standards are particularly important to realize the full benefits of electronic information dissemination. If government documents (whether reports, pamphlets, manuals, other text, or text plus tabular and graphics material) are not prepared in a standardized electronic format using standardized codes and descriptors, substantial and costly recoding and rekeyboarding may be necessary at later stages of the dissemination process. Text markup standards are intended to establish a consistent set of codes for labeling key elements of a document—such as chapter titles, paragraph indentations, tabular presentations, and the like. If these electronic codes are widely agreed upon and used (i.e., standardized), then the documents can be electronically transferred from one stage in the dissemination process to another with little or no additional effort and cost, if the equipment is designed to be compatible with the electronic codes. Three major approaches to text markup standards are:

- GPO's logically structured full text database standard;
- Standard Generalized Markup Language (SGML), an international standard that has been adopted by DoD and NBS; and
- Office Document Architecture (ODA), an international standard under consideration by NBS.

Page description standards are also very important. If the language or code used by the page composition equipment is not compatible with the code used by the output devices (e.g., printers), then additional work is required to convert the codes. Sometimes it is easier just to rekeyboard and recode the entire document, at significant additional cost. Page description languages are intended to establish a consistent set of codes compatible with both composition and output equipment. One possible page description standard is PostScript, a defacto industry standard under consideration by NBS and the national and international standards organizations. Another possibility is the Standard Page Description Language (SPDL) now being developed.

SOURCE: National Bureau of Standards, Defense Technical Information Center, and U.S. Government Printing Office, 1988.

private electronic news and wire services, and to the DLP. A major issue concerns equity of press access and the need to ensure that cost or technical requirements do not discourage smaller, less affluent, and/or out-of-town news organizations from realizing the potential benefits. While electronic press releases can be more timely and cost-effective than messenger or mail delivery of paper releases, dual format (paper and electronic) would appear to be necessary—at least for a lengthy transition period—for those news outlets without, or lacking interest in, online electronic capability.

Photo credit: USA TODAY, Gannett, Co., Inc. all rights reserved

Reporter sitting at video display terminal

STATUTORY/OVERSIGHT CHANGES

Congress could amend the Printing Act, Depository Library Act, and Paperwork Reduction Act to provide statutory direction for specific institutional and technical/management alternatives, as well as to provide general philosophical guidance on electronic information dissemination.

At the most basic level, a fundamental crosscutting issue is public access to Federal information. Debate over the use of electronic formats, privatization, and the like is obscuring the commitment of Congress, as expressed in numerous public laws, to the importance of Federal information and its dissemination in carrying out agency missions, and the principles of democracy and open government. A renewed congressional commitment to public access in an electronic age may be needed.

Congress may wish to legislate a governmentwide electronic information dissemination policy. In so doing, Congress would need to consider several sometimes competing considerations, including: enhancing public access; minimizing unnecessary overlap and duplication in Federal information activities; optimizing the use of electronic versus paper formats; and optimizing the role of the private sector. OMB has promulgated its own view, albeit controversial, of appropriate public policy (in the form of OMB Circular A-130). The vast majority of agencies do not have policies on electronic dissemination (see Table 1-10). As agencies begin to develop such policies, the OMB view is likely to have a dominant role, in the absence of clear and positive congressional guidance. **Congress may wish to amend specific statutes or otherwise promulgate its own views on the basic principles addressed and policies enunciated in OMB Circular A-130 as it relates to Federal information dissemination.** In particular, Congress could provide more specific guidance on the role of the private sector and contracting out of Federal information dissemination, user charges, and provision of value-added information products. Congress could also make any necessary adjustments in oversight mechanisms (such as establishing a Joint Congressional Committee on Government Information).

With respect to the Freedom of Information Act (FOIA), this statute too was enacted in an era when paper records were the dominant form of government information. The application of FOIA to electronic formats has created a number of problems. The courts have expressed a need for Congress to clarify gray areas left open by the statute. For example:

- The case law as applied to paper information establishes that FOIA does not require agencies to create new records in

Table 1-10.—Federal Agency Policies on Electronic Information Dissemination

Policies and procedures for	Percent of agencies having documented policies	
	Dept.[a]	Ind.[b]
Public access to agency electronic databases?		
yes	9.6	10.4
no	90.4	89.6
Electronic dissemination by agency contractors?		
yes	7.9	6.3
no	43.0	41.7
do not use contractors	49.1	52.1
Applicability of FOIA to electronic formats?		
yes	18.4	25.0
no	81.6	75.0

[a]Percent of 114 departmental civilian agency components responding.
[b]Percent of 48 independent civilian agency components responding.

SOURCE: General Accounting Office Survey of Federal Agencies, 1987.

fulfilling requests. When additional programming is required to extract information from computer systems, agencies and courts have sometimes held that such programming would be analogous to record creation, and therefore would not be a required part of the FOIA "search" process. In the electronic age, however, some degree of reprogramming or program modification may be essential to obtain access to electronic information.

- Another gray area involves defining a "reasonable effort" on the part of the government in searching for records responsive to a FOIA request. In the computer context, the programming/no programming distinction has begun to separate decisions about "reasonableness" from considerations of effort. This is incongruous with tradition, as significant expenditures of effort continue to be involved in manual FOIA searches. Retrieval of paper documents may involve extensive tracking, communication with various bureaus, consolidation of disparate files, and substantial hand deletions of exempted materials. As computer capabilities for searching, segregating, and consolidating of data become increasingly efficient and cost-effective, computer searches could be broadened and public access enhanced. Agencies may need to focus on designing new ways to respond more readily to FOIA requests for computer records.
- Another issue is whether and under what conditions the advantages of electronic formats are such that access to the format as well as the information itself should be guaranteed. Although the case law and the FOIA fee guidelines have established that computer-stored information is subject to FOIA, requesters are not guaranteed access to the information in formats other than paper. If large quantities of data could be more effectively utilized with the flexibility offered by magnetic tapes, disks, or online retrieval, access to these electronic media may be important.

Congress could amend FOIA to bring electronic formats clearly within the statutory purview, define the scope and limits of FOIA searches in an electronic environment, and clarify fees and procedures for FOIA requests for electronic information. For the 1990s and beyond, Congress may need to decide whether the FOIA should continue to be viewed as an "access to records" statute, or whether it should be perceived more broadly as an "access to information" statute. Due to the explosive growth in electronic information storage, processing, and transmission by the Federal Government, traditional views about records and searches may need to be modified to ensure even basic access to computerized public information.

LEGISLATIVE BRANCH

Congress itself is a major source of Federal information. Congressional information ranges from the *Congressional Record* to congressional calendars and schedules to the status of pending legislation to a wide range of committee reports, and to numerous documents produced by the analytical support agencies (Congressional Research Service [CRS], General Accounting Office [GAO], and Congressional Budget Office [CBO], as well as OTA). Most of this information has been and continues to be available in paper formats. However, increasingly, electronic formats offer significant advantages in terms of timeliness and searchability, and are being utilized by private vendors and congressional in-house support offices (e.g., the House Information Systems Office and CRS) for a growing range of congressional information.

To a large degree, OTA's general findings about technological trends and opportunities also apply to congressional information. Electronic options offer the potential to make con-

gressional information more quickly and widely available. This can be very important for citizens and organizations—whether consumer, library, research, labor, or business in nature—that desire to closely follow congressional activity and/or participate in the legislative process. As congressional offices automate, increasing amounts of information are created, revised, and stored in electronic form. This creates the potential to apply "information life cycle" and "multi-format output" concepts to the legislative branch as well as to the executive branch. Again, common technical standards will be important in realizing this potential.

Congress has the opportunity to establish a strategic direction for electronic dissemination of legislative branch information. The importance of congressional information to an informed citizenry and the need to ensure equitable channels of access for all interested citizens, including access to electronic formats, are widely accepted in principle. The differences of opinion focus on the means of implementation.

In setting an overall direction, Congress will need to determine its own level of responsibility for ensuring that electronic congressional information is readily available to the public, and how that information should be made available (by GPO, other congressional offices, and private vendors). For example, because of GPO's growing role in providing electronic formats to Congress as part of the electronic publishing process, GPO is positioned to more actively participate in disseminating electronic congressional information to the GPO depository libraries and the public-at-large. At the same time, some commercial vendors would like to contract directly with Congress, perhaps on a bulk rate discount basis, for electronic dissemination of congressional information to libraries, the public, and Congress itself.

Finally, given the large number of House, Senate, and congressional support offices and units involved with the creation and dissemination of congressional information, Congress may wish to establish a formal coordinating mechanism to maximize the exchange of learning and minimize the potential overlap, and to take advantage of the opportunities for technologically enhanced access. In many respects, congressional decisions on electronic dissemination of congressional information are just as important as prior decisions on radio and television coverage of congressional hearings and floor sessions.

NOTE: Copies of the report "Informing the Nation: Federal Information Dissemination in an Electronic Age" can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325, GPO stock No. 052-003-01130-1.

Related OTA Reports

For discussion of related topics not covered in this report, see the other OTA reports listed below. These reports cover such topics as: the tension between public access to government information and: protection of national security interests; physical security and data integrity; privacy rights of individuals and organizations; and intellectual property rights. Other reports cover the need to preserve government information for archival and historical purposes, and the need to consider government information in the context of long-term social, political, and economic changes relevant to the information and communication infrastructure of the United States.

- *Medlars and Health Information Policy—A Technical Memorandum*, OTA-TM-H-11, September 1982. NTIS order #PB 83-168 658.
- *Federal Government Information Technology: Electronic Surveillance and Civil Liberties*, OTA-CIT-293, October 1985. GPO stock #052-003-01015-1; $3.00. NTIS order #PB 86-123 239/AS.
- *Federal Government Information Technology: Management, Security, and Congressional Oversight*, OTA-CIT-297, February 1986. GPO stock #052-003-01026-7; $7.50. NTIS order #PB 86-205 499/AS.
- *The Regulatory Environment of Science*, OTA-TM-SET-34, February 1986. GPO stock #052-003-01024-1; $6.00. NTIS order #PB 86-182 003/AS.
- *Intellectual Property Rights in an Age of Electronics and Information*, OTA-CIT-302, April 1982. GPO stock #052-003-01036-4; $15.00 NTIS order #PB 87-100 301/AS.
- *Federal Government Information Technology: Electronic Record Systems and Individual Privacy*, OTA-CIT-296, June 1986. GPO stock #052-003-01038-1; $7.50 NTIS order #PB 87-100 335/AS.
- *Commercial Newsgathering From Space*, OTA-TM-ISC-40, May 1987. GPO stock #052-003-01066-6; $3.00.
- *The Electronic Supervisor: New Technology, New Tensions*, OTA-CIT-333, September 1987. GPO stock #052-003-01082-8; $6.50.
- *Defending Secrets, Sharing Data: New Locks and Keys for Electronic Information*, OTA-CIT-310, October 1987. GPO stock #052-003-01083-6; $8.50.
- *Science, Technology, and the First Amendment*, OTA-CIT-369, January 1988. GPO stock #052-003-01090-9; $3.50.
- *Book Preservation Technologies*, OTA-O-376, May 1988. GPO stock #052-003-01103-4; $5.00.
- *Communication Systems for an Information Age*, OTA-CIT, forthcoming, spring 1989.
- *Scientific and Technical Information Dissemination: Opportunities and Problems*, forthcoming, spring 1989.

NOTE: Reports are available through the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20401-9325, (202) 783-3238; and/or the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161-0001, (703) 487-4650.

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